RTO Formation: Where Are We? What Have We Learned? What Do We Do Next?

Mathew Morey
Principal
Envision Consulting

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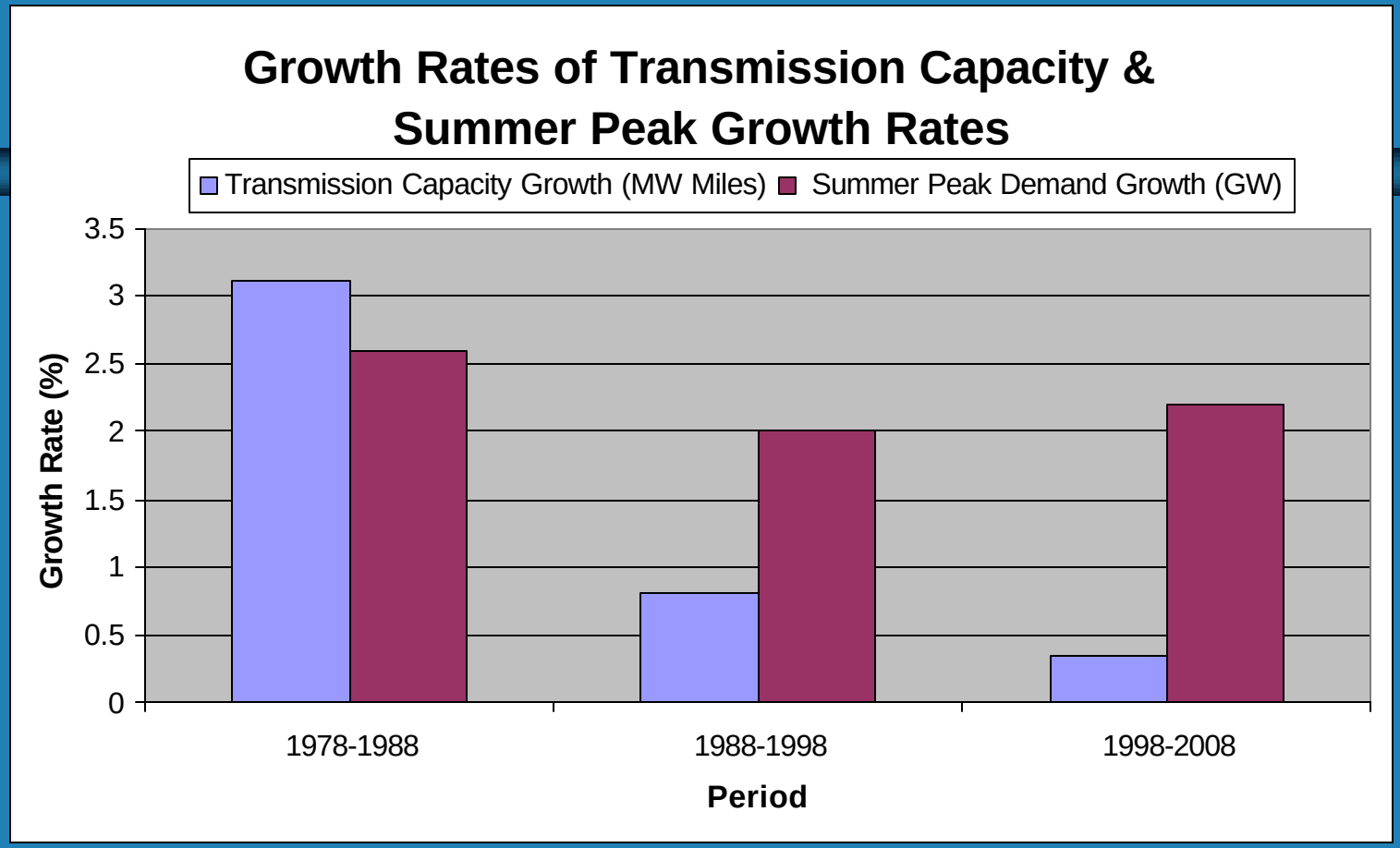
OUTLINE

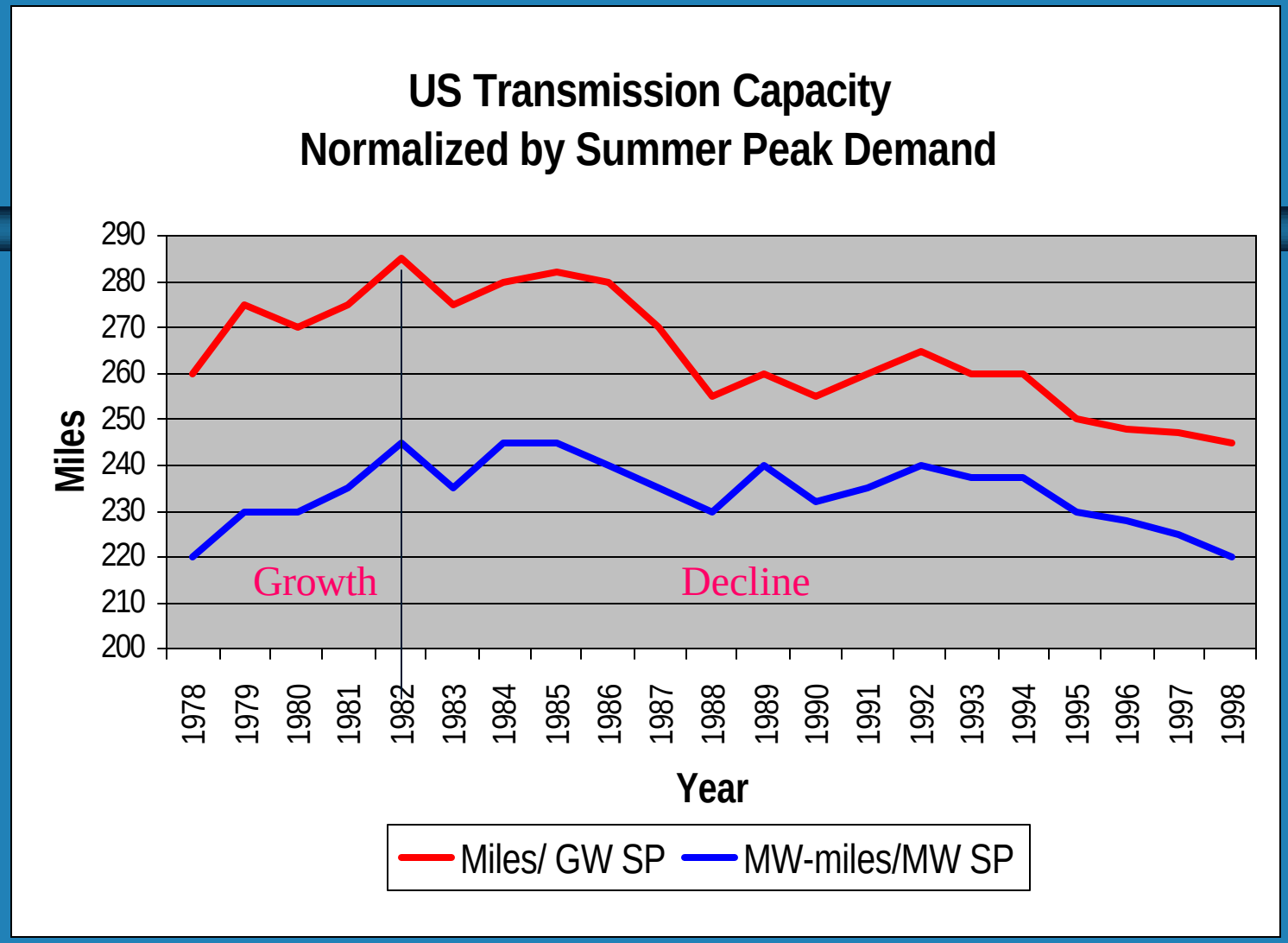
- What Have We Learned?
- Transmission Investment Trends
- Transmission Congestion Costs & Trends
- Barriers to Investment
- Fundamentals: Markets & Design
- RTO Objectives
- Regulatory Challenge
- Small Steps in the Right Direction

What Have We Learned?

- It is hard to design a competitive electricity market with good performance attributes.
  - Details of wholesale market institutions and design are critically important for creating a system that works well and they are difficult to get right.
  - There is more congestion than anyone anticipated.
  - Physical attributes of electricity supply require that restrictions be placed on the "products" exchanged and on the flexibility of buyers and sellers to change positions near real time, making it difficult to design incentive compatible rules.
- Critical transmission investment has been stymied by the challenge to design institutions to use and expand the network efficiently and manage congestion in ways compatible with other wholesale market institutions.



Source: E. Hirst, *Expanding US Transmission Capacity*



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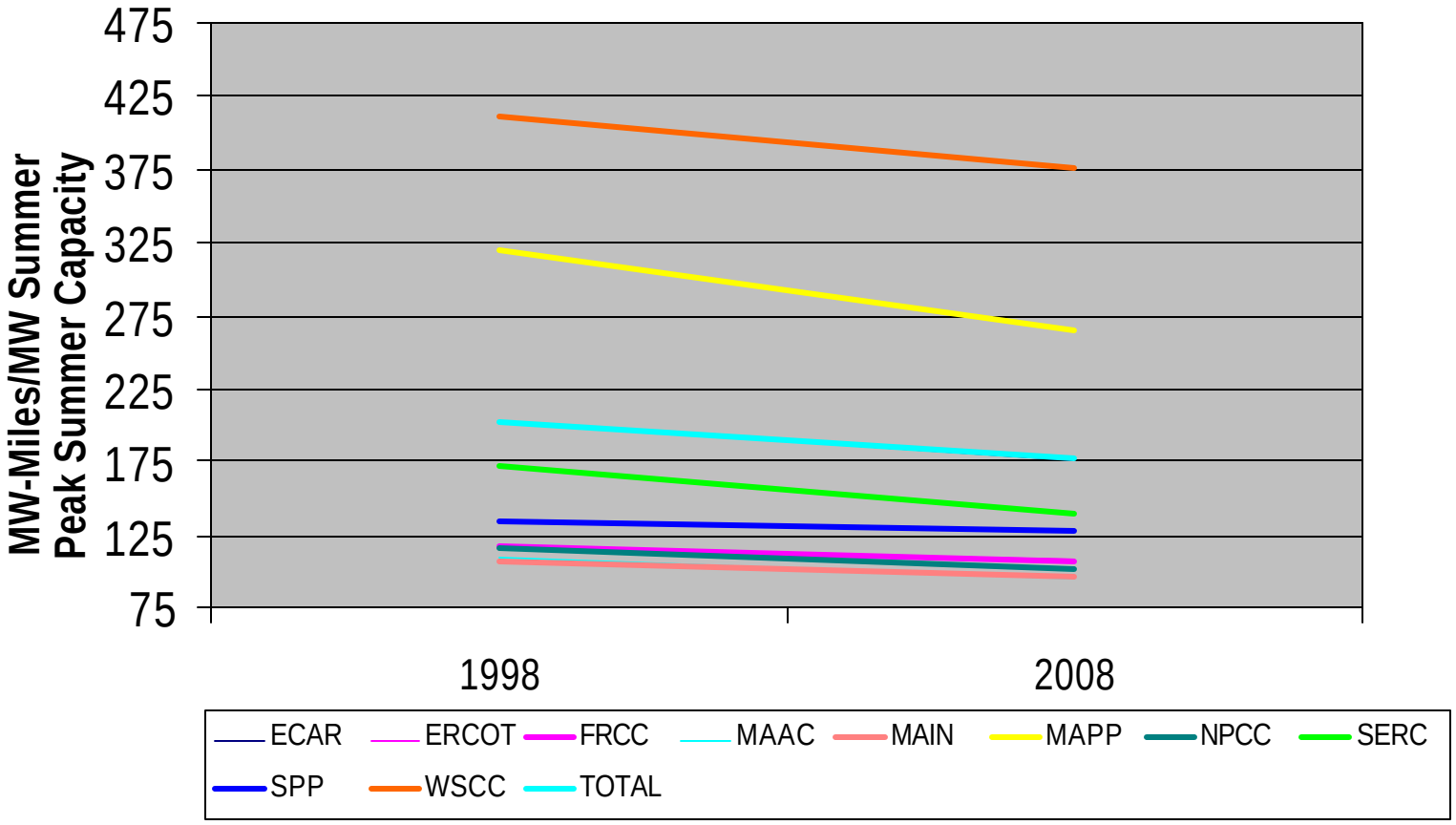
US Transmission Capacity by NERC Regional Reliability Council

1998 Actual to 2008 Projected



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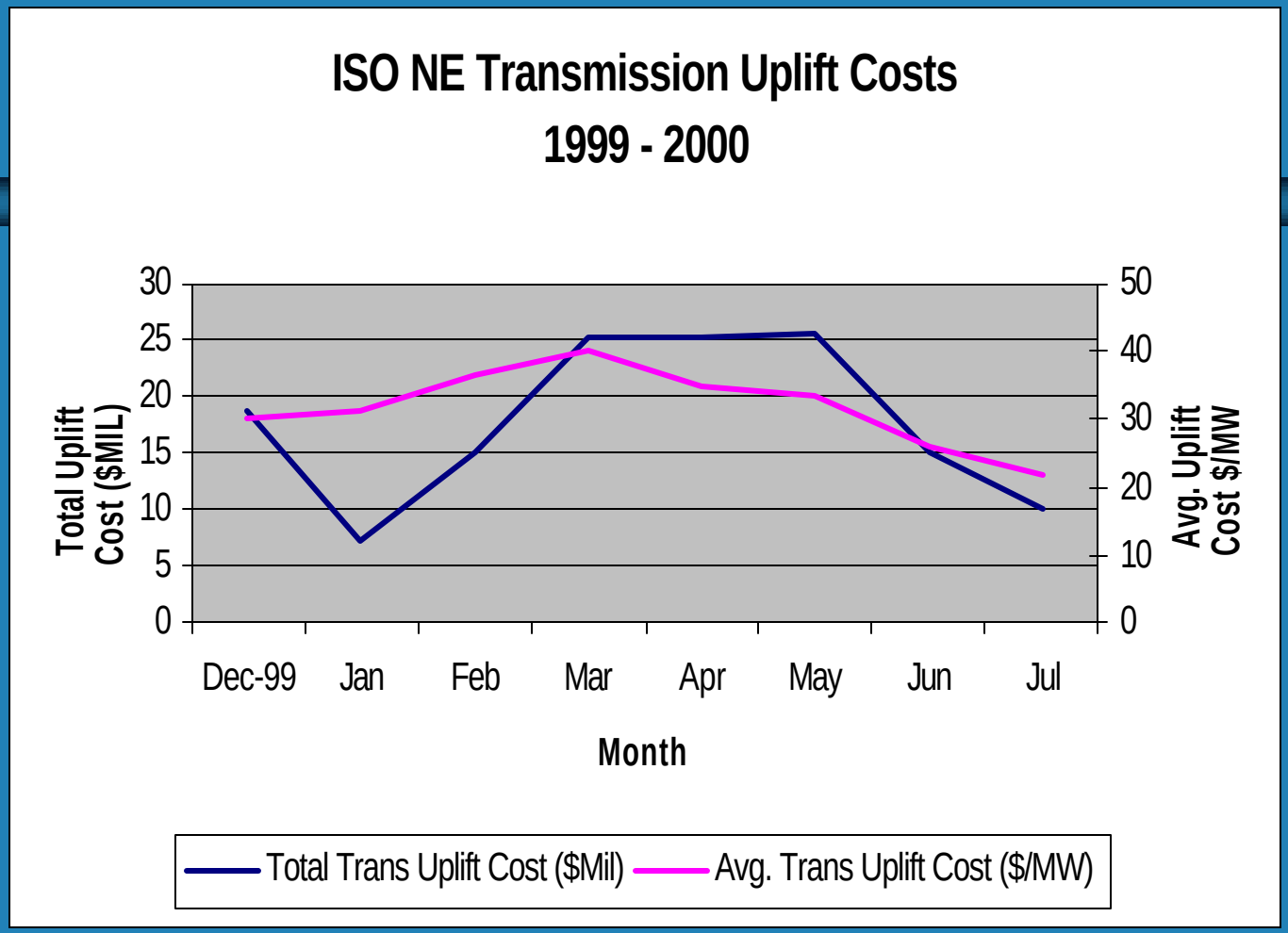
Transmission Investment

- Aprox. 7,000 miles of transmission (230 kV or higher) planned for next 10 years
- Aprox. 100,000 MW of new generation planned over next 10 years

The Costs of Congestion and Network "Imperfections"

- Performance deficiencies due to poor operating and investment incentives will appear as:
  - higher congestion and "out-of-merit" dispatch costs,
  - higher ancillary services costs,
  - increased local market power problems and the need for regulatory intervention to mitigate them,
  - increased costs and delays in connecting new generators,
  - reduced reliability, and
  - continued pollution from old, inefficient generating stations that must be operated for reliability purposes.



Source: ISO NE website

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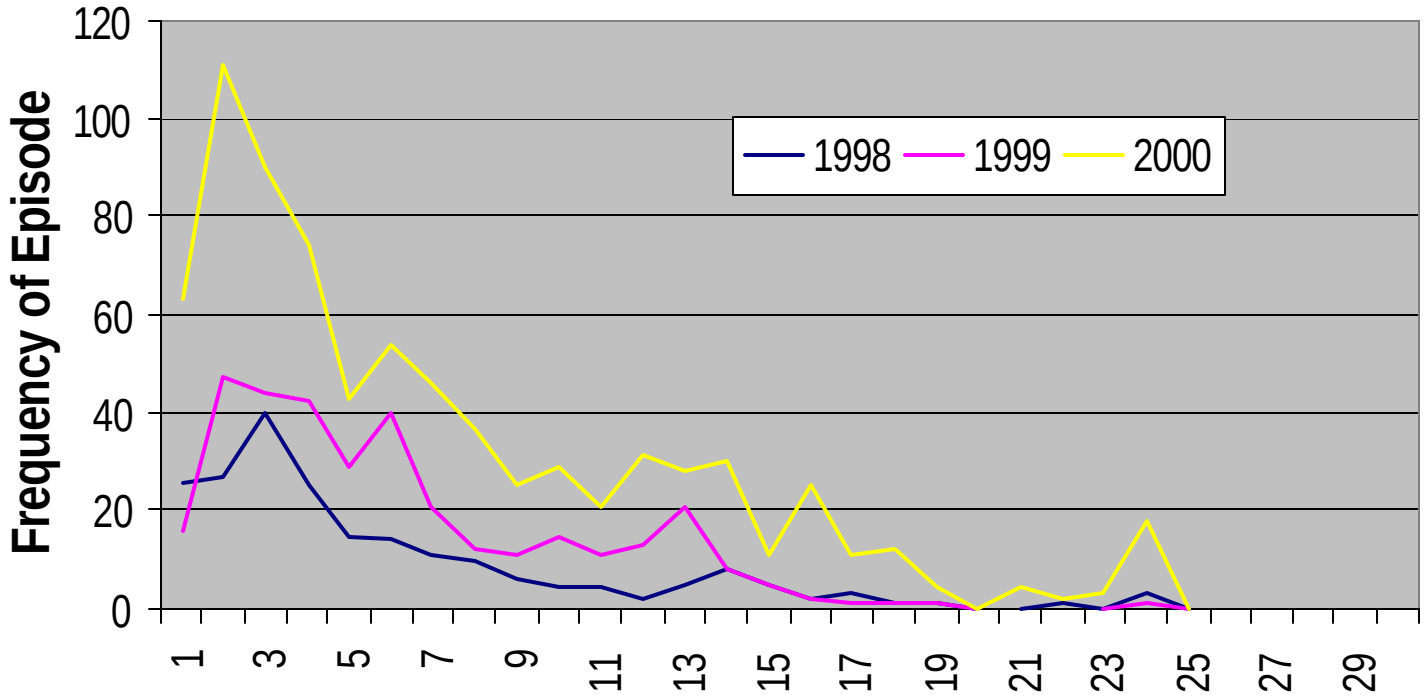
PJM Congestion Episodes, 1998 to 2000



Source: PJM Website

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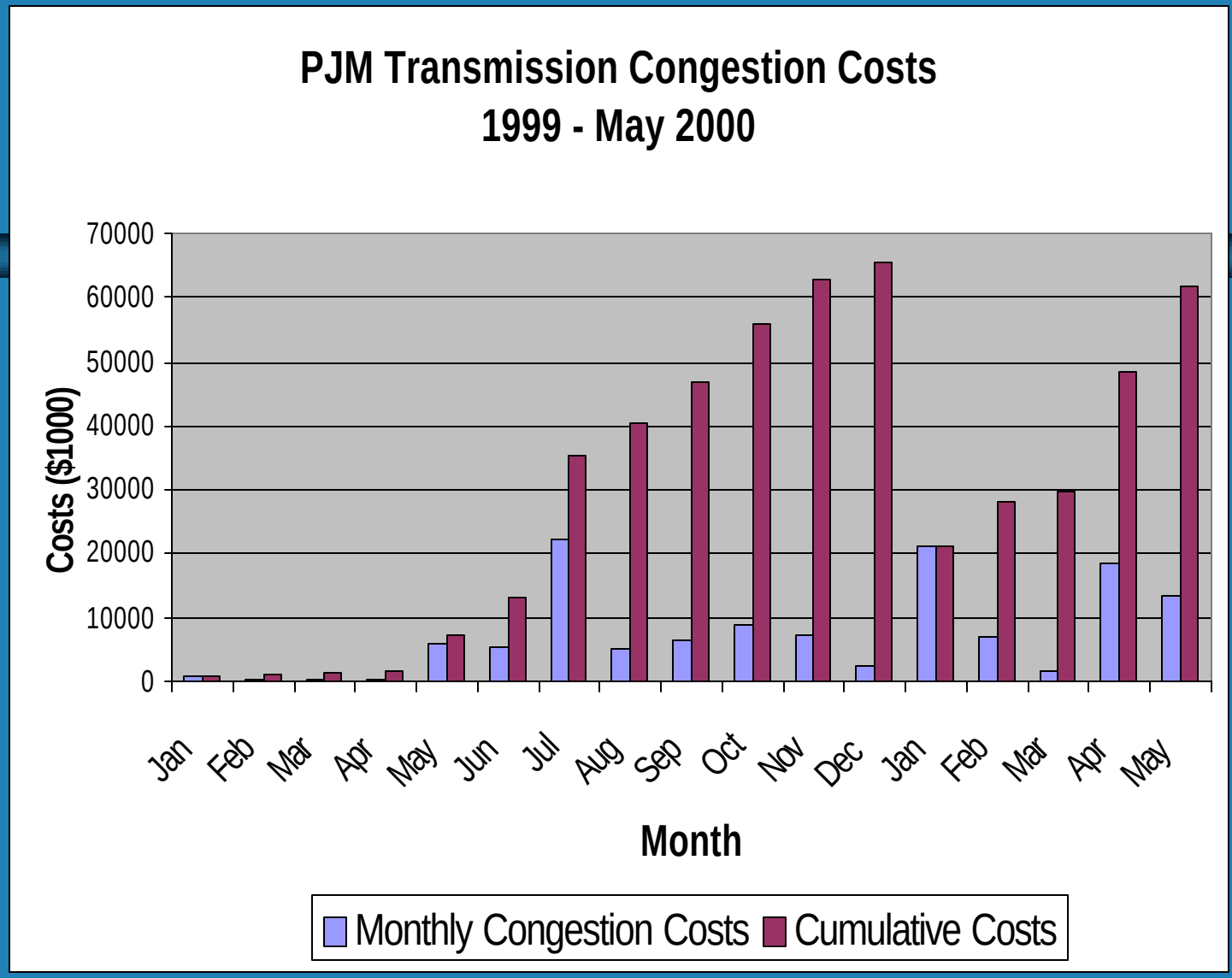

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Barriers to Transmission Investment

- Local opposition (NIMBY/NOPE).
- Local & state regulatory approval processes.
- Uncertainty about future regulation of current transmission services & assets.
- Uncertainty about level of return on future investment.

Source: E. Hirst, *Expanding US Transmission Capacity*

Rights of Way Hard To Get !

- Public opposition.
- Delays in gaining economic and environmental regulatory approvals.
- Uncertainty about the regulatory process.

Source: E. Hirst, *Expanding US Transmission Capacity*

Business Risk

- Uncertainty about regulatory approvals for cost recovery.
- Inadequate returns on investment.
- Inappropriate transmission pricing structure.

Source: E. Hirst, *Expanding US Transmission Capacity*

Lack of Information and Analytical Tools

- Little coordination between generation and transmission planning now.
- Insufficient planning tools to determine what improvements are needed.
- Inability to obtain data to justify project need.

Source: E. Hirst, *Expanding US Transmission Capacity*

Transmission & Generation Operating/Cost Complementarities

- Transmission operates as a complex "coordination" system
  - Significant economies associated with "vertical" coordination/integration.
  - Integrate dispersed generation for reliable flow to dispersed demand nodes economically.
  - Adhere to tight physical requirements to maintain network frequency, voltage and stability.

Transmission & Generation Investment Cost Complementarities

- Generator location involves tradeoffs between generating costs and transmission costs.
- Transmission capacity investments that remove network constraints can affect nodal generating costs and the nodal value of power.
- Transmission investments are lumpy, are characterized by scale economies, and can have effects on:
  - physical attributes of other network segments,
  - the economic value of generators at some nodes, and
  - the costs of serving load at other nodes.

So, What's an RTO To Do?

- Short-term
  - Minimum cost dispatch
  - Efficient congestion management
- Long-term
  - Efficient transmission expansion with an eye on:
    - Adequate supplies of energy
    - Optimal location of generation capacity
    - Optimal fuel and fuel efficiency

Tools for the RTO to do the Job

- Visible Spot Price
- Contracts
- Financial Transmission Rights

Visible Spot Price

- Promotes contracting
- Promotes system security by matching supply and demand
- Helps to integrate reserves
- Permits integration of inter-regional markets
- Foundation for FTRs

Contracts

- Promote (induce) efficient risk management.
- Reduce market power through forwards/futures.
- Protect customers.
- Encourage G&T investment.

Financial Transmission Rights

- A physical transmission right that is tradable and traded.
- Not just for hedging the nodal prices.
- Promote investment in transmission.
- Promote efficient location of generation.
- Promote efficient fuel/technology choices.

Minimum Cost Dispatch

- Treatment of imbalances is key.
- Gross pools, or net pools & bilateral trading are the same if imbalances are settled at the market price.
- The RTO should reschedule for least cost using incremental and decremental bids.
- Firm physical supply/demand schedules necessary at least several hours before real dispatch.

Efficient Congestion Management

- Congestion management is the brain of the trading system; can't be done in isolation from other wholesale market institutions .
- Important for minimum cost dispatch and system stability.
- Congestion management by *visible* price ensures:
  - short-run cost of generation minimized, and
  - short-run value of transmission maximized.
- NERC's TLRs "necessary " in the transition but seriously inefficient.
- LMP works, FTRs can enhance it.

Efficient Transmission Expansion

- Short-term congestion costs plus losses signal the need for transmission expansion, but nodal price differences are not efficient investment signal.
- Internalize all costs & benefits of how and when to expand to reduce congestion costs and losses.
- Timing and “line size” decisions made under PBR/price cap regulation: amortized costs less than present value of savings (*i.e.*, avoided congestion costs and losses)

Regulatory Challenge

- Policies that encourage institutional designs that are consistent with:
  - Minimizing total network operating costs
    - Managing congestion efficiently.
    - Managing network maintenance efficiently.
    - Providing for ancillary services at least cost.
  - Stimulating efficient investment in transmission that in turn induces efficient investment in generation.

Small Steps in the Right Direction

- LMP for congestion management.
- Price caps with RTO fully responsible for reducing grid "imperfection" costs but allowed to keep a reasonable portion of the "rents," *i.e.*, price - (CC + losses) .
  - Paying a bit more for transmission and getting a little more investment than is optimal may be small price to pay to reduce costly grid imperfections.
- FTRs, with rights for the life of the line.
- Close, friendly ties with state agencies.